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Goddard Space Flight Center
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NASA

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Reply to Attn of: **934**

Mr. Gary G. Metz
U.S. Department of Interior
Geological Survey
EROS Data Center
Sioux Falls, SD 57198

Dear Mr. Metz

Scrounge processing of TM data has been viewed prior to launch
as an R&D effort since the characteristics of the data will not
be completely known until after we receive real TM data.
Therefore, this letter gives very specific information on the
format of the film product and the type of film; however, only
the values of the end points are given for the gray wedge
densities.

Film that will be used by LAS, to produce the first generation
negative is Kodak Linagraph Shellburst 2474, a medium speed,
medium granularity and high resolving power film. The 50% MTF
point for this film is at approximately 45 line pairs/mm.

The format of the output film product is shown in the attached
diagram. All pixels are 25 microns square, corresponding to a
28.5m square pixel on the ground. The specifications for the
fields identified in the diagram are given in enclosure 2.

After launch, all sixteen values for the gray wedge will be available and will be passed on to you. If there are additional questions after reviewing this letter, call me on FTS 344-9516.

Sincerely,

Valerie L. Thomas
Scrounge Coordination Manager

Enclosures:
1. LAS Film Product Format
2. P Film Format Description
3. Optronics L5500 and Kodak 2474 Film Gray Scale on the First Generation Negative
4. Annotation Field
5. Image Gray Scale

cc: D. Fischel, NASA/GSFC
    J. Lyon, NASA/GSFC
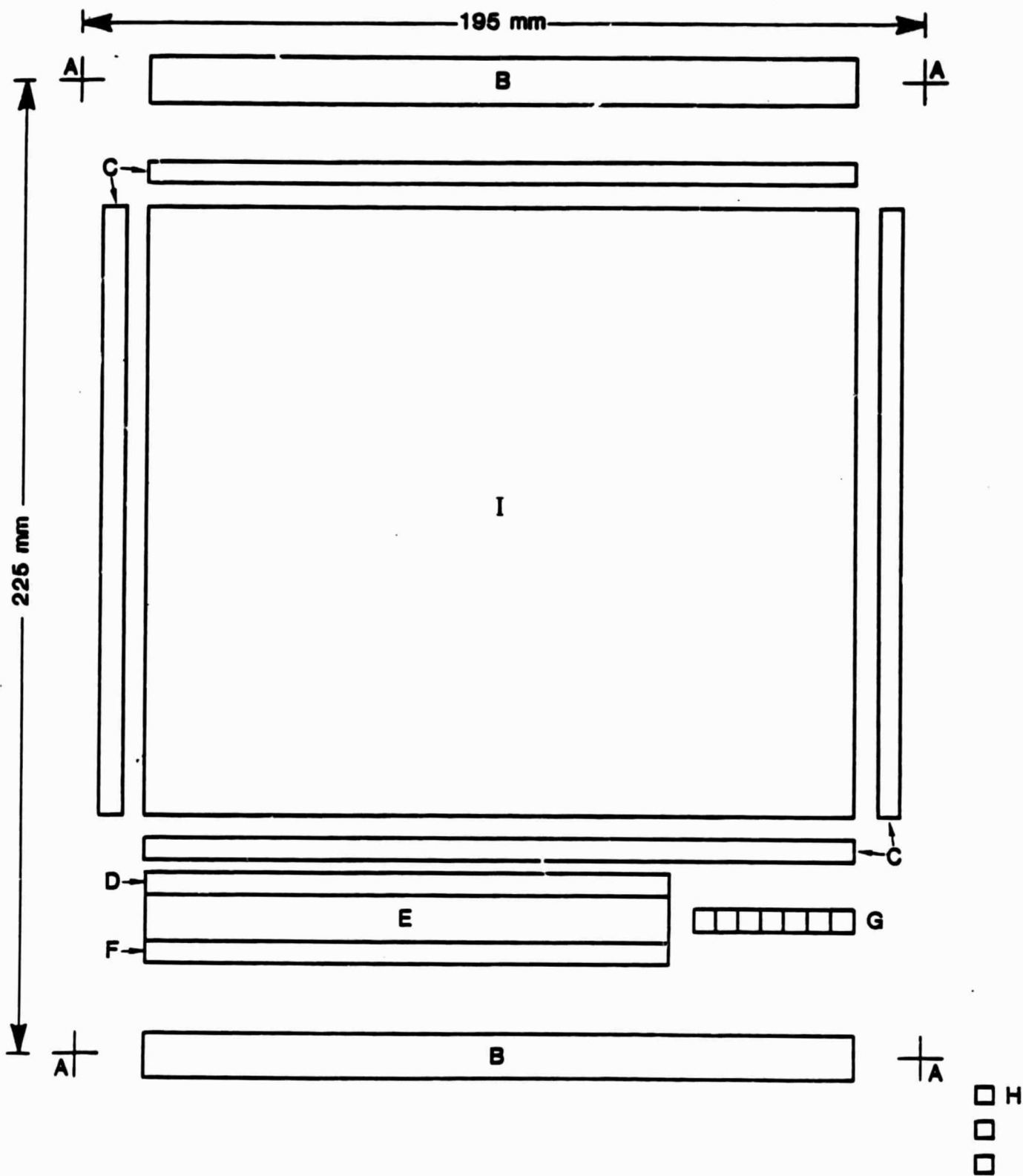   B. Webb, NASA/GSFC

Figure 1.   LAS Film Product Format.

P Film Format Description

A. Registration Marks - Four crosshair registration marks are positioned well outside of the main image area. In the x-direction they are 195mm apart and in the y-direction they are 225mm apart. The crosshair lines are two pixels wide and 401 and 400 pixels long (in the x- and y-directions, respectively).

B. Gray Scales - Two gray scales, one at the top of the image and one at the bottom, are positioned between the registration marks. There are 16 steps which reflect the true response of the Optronics L5500 and Kodak 2474 film. The gray scale table is given in Table 1.

C. Tick Mark Areas - There are four tick mark areas, one on each side of the image (I). The tick marks are straight lines. The tick mark pixel closest to the image area is the true position of the coordinate (label is adjacent to the tick mark) and is 2.2mm from the image area (I). Up to eight tick marks may appear in each area. Coordinate lines with a tick mark which enter one side of the image and do not exit from the opposite side only appear on the top or left side, as appropriate.

D. Annotation Line - The annotation line as it appears in the HAAT data (See GES10033 dated 31 July 1981 and Table 2).

E. Gray Scale - A 16 step gray scale which reflects the look-up table applied to the data before film creation. See Table 3.

F. LAS Annotation Line - Fixed record; NASA/GSFC LANDSAT ASSESSMENT SYSTEM THEMATIC MAPPER PICTURE GENERATION MM/DD/YY PICTURE FILE NO.XXXX where MM is month, DD is day and YY is year that the film tape was generated. XXXX is the file number of the image, as written to the multi-volume tape set. (Normally the same as the band number, although this is not a requirement).

G. Band Identification - Scene band number; one digit number representing a band from 1 to 7. For color composites, there is a band identifier for each band used.

H. Color Code Blocks - Up to seven squares of highest density pixels for internal LAS use to identify non-standard color composite frames. Not normally present in standard P film products. To be ignored by users.

I. Image Area - This represents an area on the gound of 210x170km (including fill pixels). The active image area is nominally 6967 pixels (≈198.56m) wide at 25 micron square film spot per 28.5m square pixels, the equivalent map scale is 1:1,140,000.

TABLE 1

Optronics L5500 and Kodak 2474 Film Gray Scale
on the First Generation Negative

Input Gray Wedge Values	Film Density
0	0.16+0.1
17	
34	
51	
68	
85	
102	
119	
136	
153	
170	
187	
204	
221	
238	
255	2.2+0.2

TABLE 2

Annotation Field

Character Position	Example	Description
1-8	13JUL82b	Day, month and year data acquired
9-25	CbN45-19/Wb90-17b	Format center ("c") in latitude & longitude degrees & minutes
26-34	DPPP-RRR	Path and row number. D is (normal) descending mode. Ascending (night time) mode would be an "A".
35-51	NbN45-15/Wb90-15	Nominal center latitude and longitude
52-61	TM1234567	Sensor (TM) and band number (numbers). Only the true band number will be present. All others will be blank.
62-75	SUNbEL30bA015	Sun elevation (EL) and azimuth (A) in degrees.
76	g	Geometric corrections applied "S" = system level "G" = geometric level
78	p	Projection "U" = UTM, "S" = SOM
80	c	Resampling algorithm;always cubic convolution
81	e	Type of ephemeris used "P" = predictive "G" = GPS "O" = onboard computer

TABLE 2 (con't)

Annotation Field

Character Position	Example	Description
83	q	Processing procedure "N" = normal "A" = abnormal
88-100	NASAbLANDSATb	Agency and project
101-115	E-41042-10632-B	Scene identification number. B is the band identifier.

b=blank field

TABLE 3

Image Gray Scale

Input Gray Wedge Values	Film Density
0	0.16±0.1
17	
34	
51	
68	
85	
102	
119	
136	
153	
170	
187	
204	
221	
238	
255	2.2±0.2